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ABSTRACT

Because of practical needs, this author sketches, based on the EATPUT model, a Micronesian Information system, which is a prototype for developing an actual system, The prototype also can be applied to other Pacific locations for developing their systems. It is hoped that a Pacific information network can be established later when various regional systems are developed. Communications means, information nodes, and management matters are suggested. The issues of personnel, funding, governmental regulations, and transborder data flow are also discussed.

INFORMATION NETWORKS

The advancement and convergence of computer and telecommunication technologies have made it a reality that individuals can have instant access, as shown in figure 1,[1] to virtually all computerized information resources when they are equiped with workstations that are configured in an infrastructure. In realization of this capability and the importance of information resources to the power and strength of a nation, Japan and western European countries have invested enormous sums in emerging technologies such as supercomputers, artificial intelligence, and sophisticated workstations.[2] The U.S. Congress has also passed bills to appropriate funds for research in high performance computing and specifically for the development of the National Research and Education Network (NREN).[3]

As conceived, NREN will link together thousands of college and university campuses, libraries, information centers, and research laboratories; providing its users with high-speed access to enormous resources of computing power, and enabling them to exchange huge quantities of computerized information. Its transmission speed is projected to reach 3-gigabits per second by 1996. The current speed is about 1.5 million bits per second.[4]

In reality, hundred of computer networks have been established in the world since the creation of the ARPANET in 1969.[5] BITNET, Internet, EARN, NSFNET, PACNET, and USENET are some of the best known networks.[6] There are also thousand of local, national, and international library utilities for bibliographic information or full text, such as BRS, Dialog, Medline, OCLC, RLN, UTLAS, and WLN.[7,8] By means of telecommunications networks, individuals are able to search and download information or text stored in different bibliographic utilities.

Because of the above realities and the needs of resources sharing, George J. Boughton,

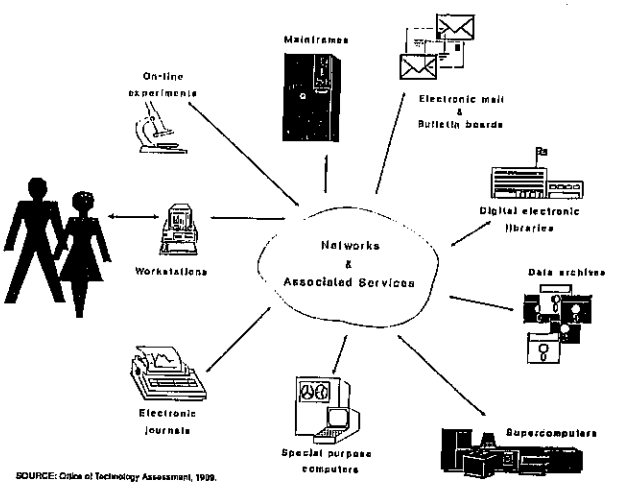


Figure 1. An information infrastructure for Research

et al.[9] and Donald H. Rubinstein[10] have discussed broadly ideas of information networking among the Pacific nations. Curtis Hardyck, Vice Provost, Information Systems & Technology at the University of California, Berkley, also introduced a Pacific Neighborhood Project (PNP) in the Third Annual Conference of Pacific Rim Public University held in Korea in 1992. The PNP's goals are "a seamless, transparent, high speed network, allowing access to a tremendous variety of information, including detailed images, from all participating countries.[11]

MICRONESIAN INFORMATION SYSTEM

Along with these ideas, Chih Wang has specifically sketched a model of Micronesian information system,[12] which is described as a prototype for developing an actual information system in the Micronesian region. The recent installation of the Dynix library automation system, the initiation of a campus network, and the projection of an Internet node on Guam at the University of Guam will lay the foundation for the proposed Micronesian information system. The conceived model also can be applied to developing information systems in other Pacific regions as well as in other locations. When local, national, and regional systems are developed and when information nodes are established in various locations in the Pacific rim, they can be linked together hierarchically to form a Pacific information network as discussed by Boughton, et al. and Rubinstein. The network should be able to serve PNP to accomplish the goals set forth in the project.

The model of the Micronesian information system is sketched within the geographic area of the American flagged Micronesia, that includes the Commonwealth of the Northern Mariana Islands (CNMI), the Federated States of Micronesia (FSM), Guam, the Republic of Palau, and the Republic of Marshall Islands (RMI). Kiribati and Nauru, the two independent republics, are geographically located in Micronesia but not considered in the model. The functions of the proposed Micronesian informaton system will be to connect and enhance communications among the isolated islands in the region and to link these islands with the United States and the rest of the world for the flow of information.

The model is conceived based on that of EATPUT, shown in figure 2, outlined by Anthony Debons, a pioneer of information science. According to Debons, the flow of information in a system normally consists of six non-linear and recursive processes, that are modified after the human organism. In the system, the **E**vent world is the occurrences in an environment that are relevant to the objectives and functions of an information system. Selected and needed data are **A**cquired and **T**ransmitted from the event world to the information system. These data are **P**rocessed for human **U**tilization to solve problems, make decisions, or update knowledge. The data are evaluated and fed back for improvement through the **T**ransfer process.[13]

In this and other information systems, human organs, print media, radio, computers, communications lines, and satellites are all but

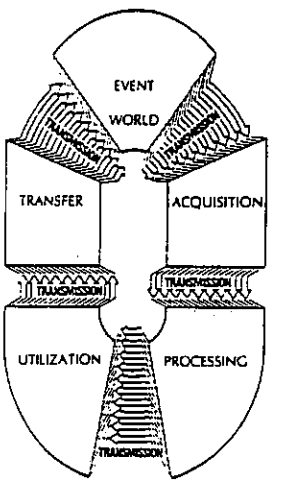


FIG. 2. Debons's information system model. *Source:* Morton, P. (1985, May). "A model for planning effective information system." *Journal of Information and Image Management, 18,* 9–19. Sketched by P. Morton.

different means employed to acquire, transmit, and process data or message. Each of these communications means, however, has its limitations. With the cutting-age computer and communications technologies configured in an information infrastructure, one certainly can have much faster access to a much better and greater quantity of information resources than one who employs natural human organs, print, or other traditional media as communications means.

Following the framework of the EATPUT model and based on the realities in the event world, a Micronesian information system is configured in figure 3. In the configuration, CNMI, FSM, Guam, the Republic of Palau, and RMI are connected with each other with telecommunications means. These entities also can link individually with the different bibliographic utilities, online information databases, and other media sources in the United States as well as in other countries if they so wish.

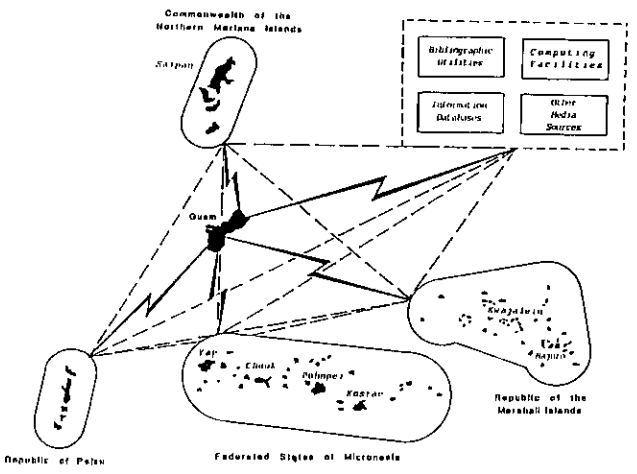


FIG. 3 A Micronesian information system

COMMUNICATIONS CHANNELS

The conceived system can employ the telecommunications lines available currently or in the future among the Micronesian islands and between them and the United States and other nations as its means for data communications. David Martin, Vice President of Pacific Telcom Cable, Inc., reports that there are two analog cable, TPC-1 and TPC-2, connecting the U.S. and the Far East. There is a cable line, ANZCAN, stretching from Canada through Hawaii to New Zealand and Australia. Satellite service is provided by the 174 degree E and 183 degree E Pacific Ocean Region Intelsat spacecraft. Large-capacity submarine fiber optic cables, HAW-4/TPC-3, and NPC (North Pacific Cable) also have been established.[14]

The Pacific Connection, Inc. on Guam has claimed its capability of connecting to hundreds of information databanks on the American mainland through its linkage with Tymnet, one of the switching packet networks.[15] Lori Mukaida, et al. have announced a successful test of Pacific island interactive database network access using PEACESAT (Pan-Pacific Education and Communication Experiment by Satellite). In the test, users at the remote sites actually had access to the University of Hawaii Library computer for catalog information through computer workstations, radios, and PEACESAT.[16] PEACESAT was established in 1971 and shut down in 1985. It has been reactivated and the U.S. Congress has appropriated $3.6 million to fund its operation. Arlene Cohen, et al. have demonstrated the successful access to the University of Hawaii Libraries' online catalog from remote islands by using outdial technology.[17] In the introduction to PNP, Hardyck also showed that scholars connected to the Internet could obtain from a great distance information about Korean poetry or about specialized health sciences in the collections of the University of California campuses.[18]

It is possible that the telecommunications lines reported in the previous paragraphs can be extended to link the Micronesian islands and to provide services for the proposed system. The detailed access techniques

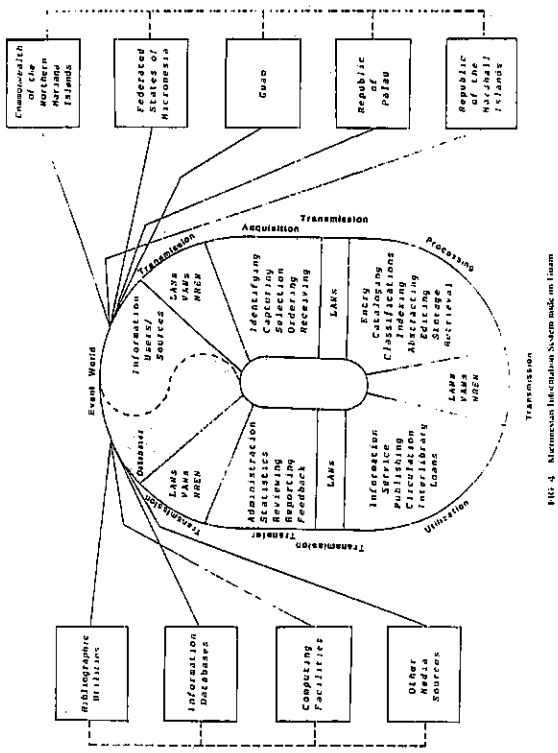
proposed by Boughton, et al. for their Pacific Regional Networks are applicable to the system when it is realized. According to them, the Micronesian islanders can dial up to a network host or an outdial modem to gain access to different information systems. The latter is devised for the hosts who are not accessible through a regional network or its gateways.

It is proposed that high volume Micronesian users can have the option of using private dial-up ports which charge a monthly flat rate fee. These services can be available at 1200 or 2400 baud asynchronously or 2400 or 9600 baud synchronously. Dedicated connections can be provided for both asynchronous and synchronous applications with the data transmission speed ranging from 1200 baud to 19.2 kilobaud. In addition, the system should be able to provide the capability of and support for multiple protocols common in the user market including asynchronous, X.25, SDLC/HDLC/QLLC interfaces, and 3270 bisync, 3270 SNA, HASP and Local Area Network (LAN) Gateways.[19]

To supplement the regular communications channels of the information system, the Mallard Mailbox can be applied as a peripheral device for the transmission of electronic data among the Micronesian islands. According to Martin Allard, the developer of the mailbox in the United Kingdom, the black box is "a small electronic device which connects between your computer and your telephone. It looks like a modem, but it is much more than that." Allard claims that "the system was originally developed as a reliable and cost effective means of communication," and has been "installed in over 40 countries."[20-22] At present, the mailbox is used for one-way communications and cannot communicate interactively.

SYSTEM MANAGEMENT

In the conceived system, Guam is planned to serve as a node because of its unique location and better resources. Built upon the EATPUT model, figure 4, Micronesian Information System: A-Node on Guam, demonstrates the major configuration and functions of the node. Briefly, the node will be responsible for the management of the information system, including personnel training, systems support, technical processing, accounting, etc. For cost effectiveness, it is suggested that the node will function as a data packet-switch point, where message is received from and relayed to the various installations. The node also will be the main location where data relevent to and needed by the Micronesian islands will be selected, acquired, processed, and stored. LANs, VANs (Value Added Networks), and/or the proposed NREN will be employed to transmit data within the node and the information system.



A consortium consisting of representatives from the participating political entities in the Micronesian information system is

recommended. The consortium will be the system's decision making body in charge of ironing out the multitude of management issues pertaining to the application of technologies, communications protocols, and cost sharing. This body also will take the responsibilities of assessing the information needs of various island entities, establishing guidelines for selecting needed materials, databases, and facilities, and setting up standards for maintaining data quality.

When the information system is implemented, scholars and students on their home islands, like anyone else of those in the developed nations, can have access to the enormous amount of computerized information resources in the world. Business people on the islands will be able to view online instantly the fluctuation of the Wall Street market. A physician also will be able to consult another doctor in a hospital in New York City for a second opinion about his ongoing operations and obtain a response just as in a face-to-face consultation. The islanders can exchange any research or business information among themselves without leaving their own homes and receive instant results.

The educators and students in the region can take advantage of the system to deliver and receive distance education. The scholars in the world, on the other hand, also can have access to the rich geographical, historical, and cultural resources stored in the region for their research about the Micronesian islands, peoples, and cultures without flying to these islands. The implementation of the proposed system certainly will facilitate the information flow between the Micronesian islands and the world.

CHALLENGING ISSUES

Several challenging issues need to be overcome for the realization of the Micronesian information system. One is the shortage of qualified library and information professionals, particularly those from the islands. It is noted that only a couple of indigenous islanders are properly educated as qualified library and information professionals.

The second issue is about funding the information system. With current economic conditions, it is unreasonable to expect that FSM, the Republic of Palau, and RMI would invest substantial funds in the development of a Micronesian information system. Historically, these islands rely largely upon the U.S. government to fund their educational, medical, and other social services. Because of the termination of the U.S. trusteeship over these islands, and because of the huge deficit of the federal government, it may not be justifiable to expect that the United States will continue to commit a large amount of funds to support the many needs on these islands. Recently, U.S. Assistant Interior Secretary Stella Guerra has warned that "the Pacific islands ... must become more self-reliant and less dependent on United States' funding for their economic and social growth."[23]

It is understood that the extension of sufficient telecommunications lines to link various Micronesian islands and the establishment of modern technological facilities on different locations will require a huge investment. With limited population, slow business, and unfavorable economies on several political entities in the region, it can be expected that the investment in the establishment of these lines and facilities will not yield a quick and high profit. It will be a challenging task to attract telecommunications companies to venture into the Micronesian region.

The third challenge deals with the issues related to the U.S. national security control of technologies and transborder data flow. The United States probably will not allow the Micronesian information system to transmit data related to

the advanced scientific research and development and the national security to the non-U.S. territories. In reality, several future participants in the conceived system are separate political entities. With regard to the establishment of a Pacific information network, there are other broader issues needed to be resolved. These include connectivity, standards, protocols, cost sharing, governmental regulations, and multi-national access, which are raised briefly in the introduction to PNP.[24]

CONCLUSION

Human society has advanced from the primitive nomadic to agricultural, industrial, and the present information age. In this dynamic movement, an individual, an institution, an island, or a nation cannot help but follow the trend of movement. When everyone takes a jet plane or drives an automobile to travel to another part of the world for business or vacation, few people will travel there by foot except when it is their hobby. The information age is here now. The Micronesian islands, and further the Pacific nations, must develop an information system so that people in the region will play a part in the information society. With an electronic information system connecting the Pacific islands and nations among themselves and with the rest of the world, the peoples in the region will have access at their homes to the information stored in the faraway world. They will also be able to share information about their peoples, cultures, and histories with other peoples in the faraway world.

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